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EDITORIAL.

The Oil Palm Industry.

The history of the plantation oil palm industry in the East covers at most twenty-five years. But short as is this history it is a record of a very remarkable development, not remarkable as regards the area planted, but on account of the increase of knowledge of the cultivation of the palm and the preparation for market of its derivatives—palm oil and palm kernels.

This progress may be accounted for by the fact that from the inception of the industry the planter has looked to the scientist and to the engineer for help and guidance, while progress has not been retarded by the necessity of overcoming prejudice and changing long-accepted principles as is so often the case in agriculture.

Perhaps the first notable advance was in the sphere of engineering. The early view was that the economic unit to plant was a very considerable area because the machinery necessary was large and expensive. Certain proprietary planters shewed that small units could be made profitable at prices then ruling and adapted machinery for the purpose. Engineering firms were not slow in giving this subject close attention, resulting in the production of machinery on a unit system to suit the requirements of estates of almost any area above 200 acres.

In field work the industry had the advantage of possessing managers with considerable experience of planting and managing rubber and coconut estates so that the organization of this work presented few difficulties to them.

Factory technique has been studied for some years by scientific officers as well as by planters and it is particularly in the factory that this close collaboration between scientist and planter has resulted in the production of a highly satisfactory commercial product.

The literature on the plantation oil palm industry is considerable, the Dutch in the Netherlands Indies and ourselves having published the results of investigations on this subject. But so rapidly has knowledge advanced, that no one book can hope for long to be up to date. Perhaps the most complete and up-to-date treatise on the subject is The Oil Palm in Malaya, published by this Department three years ago. The continued demand for this publication is proof that it remains the standard work on this subject. Yet since the appearance of The Oil Palm in

Malaya, seventeen original articles on various aspects of the plantation oil palm industry have been published in the *Malayan Agricultural Journal*. Of these articles, eleven were concerned with field work, four with the factory, while the remaining articles related to the nature of palm oil.

In addition a Special Bulletin has just come from the press which deals with stem-rots of the oil palm.

The two articles on the industry included in the present number are typical of the progress in knowledge of this crop which is constantly being brought to the notice of the public. The study of the epiphytic growths on the stems of palms records an investigation which has taken five years to complete. The conclusion drawn, *viz.* that these epiphytes do not significantly affect yield or increase the amount of stem rot is reassuring and will render unnecessary the expense of keeping the palms clean of such growths.

The second article is concerned with an improved method of drying palm kernels. It will be noted that the idea of this type of drier originated from a manager of an oil palm estate. The adoption of this system should be welcomed by the industry as it ensures a standard and high-class product and obviates the provision of considerable space for sun-drying.

EPIPHYTES ON OIL PALMS

BY
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Unless the oil palm (*Elaeis guineensis*) is cleaned at periodic intervals the stem soon becomes encumbered with a heavy epiphytic growth of ferns and seedlings of various other plants (Fig. I). This growth is rooted in the rich vegetable mould mainly formed by the decomposition of male and female inflorescences in the crown of the palm, which fall and lodge in the crevices between protruding leaf butts.

During the year 1932, as the result of enquiries at the Department of Agriculture from companies interested in oil palm cultivation, an experiment was inaugurated in Block 5A at the Central Experiment Station, Serdang, to test whether such growths affected the health or yielding capacity of the palms.

Block 5A is an area of gently undulating quartzite sandy loam containing 30 to 40 per cent. of fine fractions. It extends approximately 8.24 acres and was cleared of light secondary jungle and planted with one-year-old seedlings of the *Dura* type of oil palm during May, 1922. The plants were spaced 30 × 30 feet apart triangular, allowing 55.6 plants per acre. The area was silt-pitted during June, 1923, one silt pit 15 ft. by 2 ft. by 2 ft. being dug to each palm. The first bunches of ripe fruit were harvested in July, 1925. Artificial pollination was practised throughout the area.

From the time of planting, the block was kept clean-weeded by changkol until March, 1932, when the practice was discontinued and from that date until the termination of the experiment undergrowth was allowed to develop, except for clean-weeded strips about 15 feet wide between the rows of palms; the undergrowth was slashed back by "Tajak"* every three months.

Artificial manures were first applied to the area during April, 1932, when an application consisting of 6 lbs. per palm of rock phosphate (27 to 30 per cent. P_2O_5) and 4 lbs. per palm of kainit (20 per cent. K_2O) was broadcast in half strips between the palms and lightly cultivated into the soil. Subsequent applications in January, 1935, and in April, 1936, consisted each of 4 lbs. of rock phosphate dust (34 to 38 per cent. P_2O_5) similarly applied and turned under.

The lay-out of the experiment was as follows:—One of the planting lines ran from east to west. Accordingly epiphytes were permitted to develop on the 223 palms in the odd rows running from east to west through the area, while the epiphytes were removed at three-monthly intervals from the 216 palms in the even rows (Figs. II). The ripe fruit bunches were harvested and weighted weekly.

* "Tajak"—a heavy knife on a short shaft used for slashing undergrowth.

In the following tables the yields have been corrected so as to be strictly comparable. Owing to the fact that individual rows were not of the same length it was not possible to effect row comparisons, so that the tables show the monthly total yields for the two treatments only.

Table I.

Monthly Yields of Bunches and Weights of Bunches.

1933.

Month.	Palms with Epiphytic Growths.		Clean Palms. *	
	Bunches.	Weight lbs.	Bunches.	Weight lbs.
January ...	134	2,726	135	2,849
February ...	162	3,699	146	3,105
March ...	185	4,277	222	4,628
April ...	313	6,947	261	5,661
May ...	195	4,039	211	4,539
June ...	282	5,933	241	5,409
July ...	217	4,367	218	4,092
August ...	221	3,983	257	4,326
September ...	166	3,029	157	3,088
October ...	142	2,257	133	2,389
November ...	164	3,860	147	3,226
December ...	117	2,883	116	2,969
TOTAL ...	2,298	48,000	2,244	46,281

* Yields calculated on the assumption that the number of clean palms was equal to the number of palms with epiphytic growths *vide* p. 450.

This footnote applies to all the succeeding tables.

Table II.

Yields for 1934.

Month.	Palms with Epiphytic Growths.		Clean Palms.	
	Bunches.	Weight lbs.	Bunches.	Weight lbs.
January ...	102	2,436	109	2,721
February ...	161	3,890	149	3,961
March ...	309	7,106	273	6,840
April ...	170	3,901	163	3,724
May ...	267	5,062	220	4,751
June ...	195	3,761	193	3,783
July ...	171	3,494	172	3,505
August ...	181	3,393	196	4,296
September ...	134	2,174	102	2,022
October ...	114	2,383	103	1,923
November ...	131	2,707	119	2,696
December ...	99	2,146	109	2,866
TOTAL ...	2,034	42,453	1,908	43,088

FIG. I.
OIL PALM WITH EPIPHYTIC GROWTHS.

FIG. II.

OIL PALM CLEANED OF EPIPHYTIC GROWTHS.

Table III.
Yields for 1935.

Month.	Palms with Epiphytic Growths.		Clean Palms.	
	Bunches.	Weight lbs.	Bunches.	Weight lbs.
January ...	133	2,591	134	2,730
February ...	136	2,595	135	2,846
March ...	178	2,697	147	3,226
April ...	194	3,302	177	3,456
May ...	178	3,060	145	3,022
June ...	156	2,212	110	1,948
July ...	112	2,471	98	2,123
August ...	135	2,317	158	2,735
September ...	85	1,601	85	1,399
October ...	82	1,635	69	1,349
November ...	55	856	58	1,244
December ...	72	1,518	78	1,675
TOTAL ...	1,516	27,855	1,394	27,753

Table IV.
Yields for 1936.

Month.	Palms with Epiphytic Growths.		Clean Palms.	
	Bunches.	Weight lbs.	Bunches.	Weight lbs.
January ...	126	3,351	148	3,663
February ...	174	4,118	199	5,165
March ...	306	5,809	267	8,047
April ...	261	4,964	234	4,145
May ...	176	2,888	184	2,994
June ...	126	2,228	116	2,167
July ...	123	2,761	123	2,448
TOTAL ...	1,292	26,119	1,271	28,629

Table V.

Summary of Annual Yields of Bunches and Weights of Bunches.

Year.	Palms with Epiphytic Growths.		Clean Palms.	
	Bunches.	Weight lbs.	Bunches.	Weight lbs.
1933 ...	2,298	48,000	2,244	46,281
1934 ...	2,034	42,453	1,908	43,088
1935 ...	1,516	27,855	1,394	27,753
1936 (7 months)	1,292	26,119	1,271	28,629
TOTAL ...	7,140	144,427	6,817	145,751

Tables I to IV give the monthly total yields for each treatment while Table V gives an annual summary of yields. Perusal of these tables makes it clear that the respective totals are in very close agreement. The total weight of bunches harvested from the palms on which epiphytes were allowed to grow during the 43 months of the experiment totalled 144,427 lbs. as against 145,751 lbs. from the palms whose stems were periodically cleaned. The respective monthly means were 3,358.77 and 3,382.02 which showed a slight monthly advantage of 23.25 lbs. in favour of cleaning. Examination of the monthly totals demonstrated that there was no significant difference between these means. In other words a growth of epiphytes on the palms does not affect yield.

The writer is indebted to Mr. R. E. Holttum, Director of Gardens, Straits Settlements, and Mr. J. N. Milsum, Agriculturist, Department of Agriculture, S.S. and F.M.S. for the indentification of these epiphytes.

The following list includes the plants found growing on the trunks of the palms in the area under experiment. The fern, *Nephrolepis biserrata*, occurs in quantity; the others occur sporadically, their presence probably being governed by local conditions, and accounting for several typical weeds which occur on open land becoming epiphytes. Under the conditions obtaining at Serdang, *Nephrolepis biserrata* is the most prevalent epiphyte occurring on oil palms.

SPOROPHYTES.	Local name.
Ceropteris calomelanos.	
Davallia denticulata.	
Dryopteris subpubescens var. major.	
Gleichenia linearis.	Resam
Lygodium circinnatum.	Ribu-Ribu
,, *flexuosum.*	
Microlepis speluneae.	
Nephrolepis biserrata.	
Polypodium phymatodes.	
,, *scolopendria.*	
Pteris ensiformis.	Paku Padang.
,, *tripartita.*	
Stenochleana palustris.	Paku Miding
Vittaria elongata.	
SPERMATOPHYTES.	
(i) DICOTYLEDONS.	
Alternanthera sessilis.	Kerumak
Borreria latifolia.	
Commelina nudiflora.	Tapak Eti
Ficus religiosa.	The Bo-tree
Macaranga hypoleuca.	Mahang Puteh
,, *macrostachyus.*	
Melastoma polyanthum	Sendudok
Passiflora foetida.	Letop-Letop
Peperomia pellucida.	
Phyllanthus urinaria.	Ambin Buah
(ii) MONOCOTYLEDONS.	
Centotheca lappacea.	Rumput Silat Kain
Paspalum conjugatum.	Rumput Kerbau

At the commencement of the experiment all the palms were examined by the Mycologist for "stem rot" with which the fungi, *Fomes noxius* and *Ganoderma lucidum* are associated. During the progress of the experiment regular examinations were made to ascertain whether epiphytic growths were tending to effect the incidence of stem rot. At the termination of the experiment he expressed the opinion that the presence of epiphytes had no effect in that particular area in either increasing or decreasing the amount of stem rot.

Summary.

In an experiment on a block of 439 oil palms conducted over a period of 43 months the presence of epiphytic growths on the stems has not significantly affected the yield or increased the amount of "stem rot" in the area.

2. A detailed list of the epiphytes found growing on the oil palms under experiment is recorded.

References.

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3. Col. R. H. Beddome, F.L.S. "Handbook to the Ferns of British India, Ceylon, and the Malay Peninsula". 1883. Thacker, Spink & Co., Calcutta.
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AN IMPROVED METHOD OF DRYING PALM KERNELS

BY
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Introductory.

The moisture content of palm kernels from freshly-cracked nuts previously dried by storage in heaps for about 12 days varies from 11 to 12 per cent.

Kernels with such a comparatively high moisture content, if bagged direct will sweat and become mouldy; discoloration of the flesh will develop and the acidity of the oil increase, while the sacking material is liable to rot.

To prevent this deterioration the moisture content of the kernels when bagged must be reduced to about 7 per cent. The necessary desiccation, however, especially in the case of estates, say below 2,000 acres, has always presented a certain amount of difficulty owing to the comparatively small output of kernels being considered insufficient to justify expenditure on an elaborate mechanical drier suitable for a larger estate.

Methods of drying vary: for example, sun-drying, drying on a cement platform or on a galvanized iron tray beneath which steam pipes are fixed, while on some estates the space around the boiler is utilized. If the boiler has a brick casing the kernels are heaped on the floor against the brick wall, while if the boiler is of the locomotive type, wooden trays are ranged along the front end.

These methods cannot be described as satisfactory. In all cases drying proceeds at a very slow rate and the kernels occupy much space. There are other disadvantages; for example, with sun-drying a movable roof must be provided to shelter the kernels at night or during rain. Further, when kernels are dried on a steam-heated surface, there is a tendency to discoloration of flesh and exudation of oil, unless they are turned frequently during the process. Excessive exudation of oil is undesirable in view of the tendency of oily kernels to become mouldy. Kernels dried alongside the boiler may become contaminated with boiler ash.

The writer was asked recently to carry out some experiments on a machine with which it was claimed that the necessary moisture reduction could be effected in about 1½ to 2 hours without affecting the quality of the kernels. The underlying principle of the process is a continuous movement of the kernels while they are being heated to a definite temperature.

The machine is installed on Highlands Estate, Klang, and the results have been so satisfactory that the estate has now adopted this method in preference to that of sun-drying on a cement floor.

The design of a kernel drier in this form originated with Mr. J. Nicoll, Manager, Sungei Tinggi Estate, Batang Berjuntai.

Description of Drier.

The drier consists of two shallow open circular steam-jacketed pans, one superimposed on the other. The pans, which are lagged, are 42 inches in diameter and 11 inches high. The capacity of a pan is about 160 lbs. of kernels.

Each pan is fitted with a trap-door set in the bottom to allow the kernels to be discharged either from the upper to the lower pan or from the latter to a wooden tray fixed beneath.

The two pans are fitted with a common vertical shaft. Scoops, which just clear the bottom of each pan are fixed to the shaft and, as the latter revolves, the scoops turn the kernels continuously. The speed of the shaft is about 28 revolutions per minute.

The accompanying photograph illustrates the general arrangement of the machine.

The method of working is as follows. The upper pan is filled with kernels from a Wilder dry separator. Steam is opened and the pressure adjusted to about 10 lbs. per square inch, this pressure being sufficient to maintain a temperature of 55° to 60°C. (131° to 140°F.) in the mass. The temperature in the lower pan is usually a few degrees higher than that in the upper pan. The temperature in the lower pan should not be allowed to exceed 65°C. (149°F.). The machine is set in motion and heating continued for about 1 hour. The machine is stopped and the kernels transferred to the lower pan. The upper pan is re-filled with fresh kernels and the process continued for another hour.

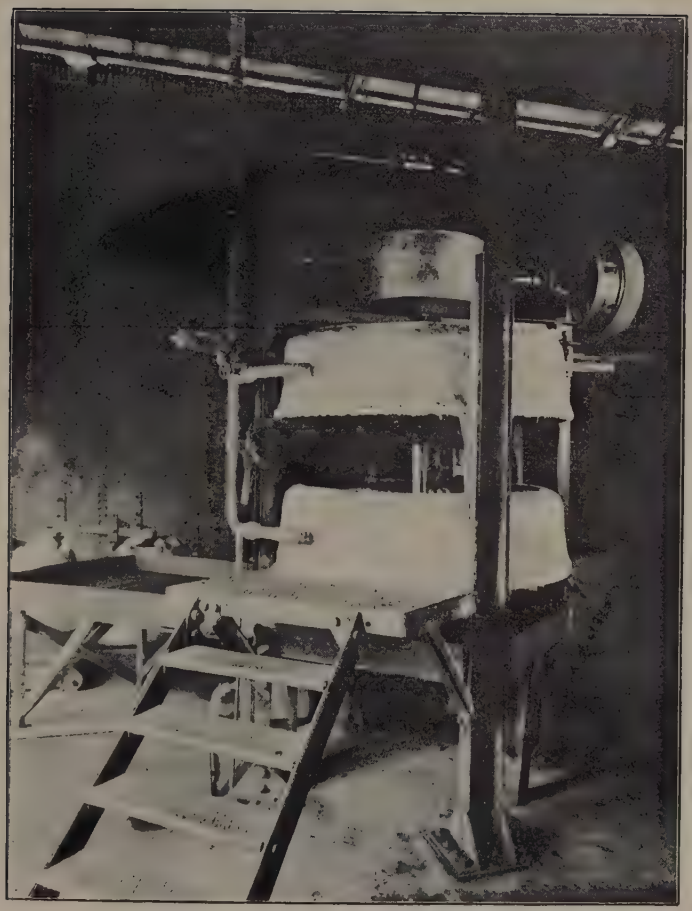
At the end of this period the kernels in the lower pan are discharged on to the tray beneath, allowed to cool for about $\frac{3}{4}$ hour and bagged. Similarly, the kernels in the upper pan are transferred to the lower pan, the upper pan being refilled as previously indicated.

Results of Experiments.

The experiments shewed that by treating the kernels in the manner described the moisture content was reduced to about 7.5 per cent. Thus, in one series, the initial moisture content was 11.8 per cent., and the final 7.6 per cent.

No further reduction in moisture content occurred as a result of allowing the heated kernels to remain exposed to the air in the factory over-night. The kernels may, therefore, be allowed to cool on the tray until the next batch from the lower pan is due for discharge, when they may be bagged.

If conditions of heating have been satisfactory the kernels will be found to be highly polished with only a slight suspicion of a film of oil on the surface. It is for this reason that controlled steam pressure is necessary and a reducing valve must therefore be fitted to the steam pipe leading to the machine. For example, in one case in which the moisture content of the stored kernels was about 15 per cent., a steam pressure of 10 lbs. for 2 hours was only sufficient to reduce the moisture content to about 10 per cent. This was insufficient to prevent mould development on bagging, and the kernels had a dull appearance.



PALM KERNEL DRYING MACHINE.

On the other hand, if the nuts have been stored for a period of between 15 and 20 days and the moisture content of the kernels is about 10 per cent., 2 hours' heating with a steam pressure of 10 lbs. per square inch will result in a copious exudation of oil, which is undesirable, as previously explained. Both period of heating and steam pressure must therefore be adjusted according to circumstances.

Further experiments showed that neither the colour of the flesh of the kernel nor the acidity of the oil was affected by the treatment.

A great advantage of this form of drier is that kernel manufacture becomes a continuous process, the stored nuts being cracked and the kernels bagged on the same day.

Assuming that the kernels must be dried for a period of 2 hours, the capacity of the machine is 10 cwt. of kernels for an 8-hour day.

The machine, which was constructed by a firm of local engineers, cost about $800 (Straits currency), ex works; with the present increase in the price of steel the cost would now be approximately $1,200.

The writer wishes to acknowledge the assistance of Mr. R. M. Bousfield and Mr. A. J. Tovey, Highlands Estate, Klang, in the conduct of this investigation.

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SAMPLING OF PALM OIL

BY
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Introductory.

From time to time reports are received from estates regarding abnormal increases in acidity of palm oil after a comparatively short period of storage. Thus, a consignment of oil has been stated to increase in acidity by as much as 0.5 per cent., calculated as palmitic acid, between an estate and Singapore, although possibly only a fortnight, certainly not more than a month, elapsed between extraction of the oil on the estate and its receipt in Singapore. No complaint was made about the moisture or dirt content of the oil or of the containers in which it was packed.

An increase of 0.5 per cent. during such a short space of time is far in excess of the normal rate associated with estate palm oil, which is about 0.2 per cent. per month. Further, small differences in technique in the determination of acidity under estate conditions and in a properly equipped chemical laboratory cannot account for the remainder of the increase. The only explanation would appear to lie in faulty methods for sampling the oil.

Since estate palm oil stored under ordinary conditions presents certain difficulties as regards sampling, an account will be given of the methods which it is suggested might be adopted according to circumstances to ensure representative samples being drawn for analysis.

Before describing these methods it may be useful to refer to the behaviour of palm oil on storage.

Behaviour of Palm Oil on Storage.

Palm oil in which the acidity varies from 3 to 5 per cent. separates on standing into a solid and a liquid fraction. The colour of the solid fraction is yellow, that of the liquid fraction deep red.

The proportions of the two fractions vary with the rate of cooling. If the oil is cooled quickly, it tends to form an orange-coloured paste, because the solid separates in a very fine state of division. On the other hand, when the oil is allowed to cool slowly, for example in a drum or a large tank, the solid separates in a coarsely granular form and sinks, leaving an upper layer of clear, deep red oil.

These fractions, which show considerable differences, can be separated by mechanical means (1).

In this article the term "fraction" applies, however, only to one or other of the two layers into which the oil separates on storage, not to the ultimate solid or liquid component of the oil prepared by suitable treatment of the appropriate layer.

Variations in Acidity between Fractions.

Previous experiments have shown the acidity of the liquid fraction to be greater than that of the whole oil, and therefore necessarily greater than that of the solid fraction (2).

To obtain a better indication of the relationship in acidity between the whole oil and the liquid fraction for varying acidities of the former a comprehensive series of samples of oil of gradually increasing acidity was prepared.

About 80 lbs. of freshly-ripe loose fruit were mixed and spread in a thin layer on the floor of the Experimental Factory. Batches, weighing about 3 lbs., were drawn at varying intervals, the fruit sterilized and the pericarp separated from the nuts. The pericarp was heated and pressed to recover the oil, which was purified by filtration through filter paper to remove the last traces of moisture and dirt.

When all the fruit had been treated, the separate samples of oil were melted and allowed to cool slowly in a large electric oven previously heated to a temperature of about 120°C. The samples of oil were left undisturbed for a fortnight.

Each sample of oil was then filtered through coarse filter paper into a tared flask, the process being also carried out in the oven. When the liquid fraction had ceased to flow, the filter funnel containing the residual solid fraction, which still held a certain amount of liquid fraction, was transferred to a steam-oven and the solid fraction thus melted collected in another tared flask. The weights of oil were recorded in both cases.

The acidity of the liquid fraction was determined; the balance of this fraction was then added to the oil derived from the solid fraction and the acidity of the mixture determined. The acidity of the original whole oil could then be calculated, knowing the acidity of the liquid fraction.

Table I gives the result of the experiment.

The results indicate that up to 9 per cent. the acidity of the liquid fraction is greater than that of the whole oil, but from 12 per cent. and upwards the position is reversed.

The existence of a transition point, which occurs between the acidities of 9 and 12 per cent. (possibly between 11 and 12 per cent. judging from the results of analysis of Sample No. 7) was suggested by Buckley. (1)

From the point of view of Malayan estate palm oil in which the maximum limit of acidity is 5 per cent. the figures confirm the previous results in respect of the higher acidity of the liquid fraction compared with the whole oil. The differences must not be regarded, however, as absolute, but only as an indication of those which may be expected when dealing with oil of this quality. Thus, in another experiment the following figures were obtained:

	Acidity (calculated as palmitic acid) per cent.
Liquid Fraction	3.81
Whole Oil	3.69

Table I.

Corresponding Acidities of Whole Oil and Liquid Fraction of Oil with Varying Periods of Storage of Fruit.

Serial No. of Sample	Period of Storage of Fruit	Acidity of Oil (calculated as palmitic acid)	
		Whole Oil	Liquid Fraction
	days	per cent.	per cent.
1	1	2.03	2.11
2	2	3.63	3.98
3	2½	4.26	4.68
4	3	6.07	6.65
5	3½	7.16	7.54
6	4	8.49	8.94
7	5	11.82	11.73
8	6	13.28	12.80
9	7	18.80	16.11
10	8	22.84	19.66
11	9	25.29	22.15
12	10	26.04	22.87
13	12	29.23	24.32
14	14	31.65	27.33

In this case the difference in the acidity is only 0.12 per cent. compared with 0.35 per cent. in the previous experiment, the whole oil in both cases being of approximately the same acidity.

The acidities of the residual solid fractions were not determined. As indicated previously, these contained varying proportions of the liquid fraction, so that the acidity figures could be regarded only as rough approximations.

Methods Used for Sampling Palm Oil.

In the early stages of the industry, when the oil was packed in wooden barrels, the latter were rolled backwards and forwards along the floor of the factory with the object of mixing the contents before drawing the sample. This procedure was based on West African practice.

The method was found to be somewhat laborious when dealing with a large number of barrels. Further, although the barrel might be rolled as described for several minutes, a sample drawn either direct from the bung-hole or by means of a glass tube inserted into the barrel was often found to be streaky, that is, the solid fraction had not been completely re-incorporated with the liquid fraction. It was also found on occasions that a portion of the solid fraction adhered tenaciously to the inside surface of the barrel and did not mix with the remainder of the oil.

The method was considered, therefore, too unreliable for use with an oil of low acidity, which was being sold under guarantee and in which a difference of a fraction of 1 per cent. in the acidity determination due to unrepresentative sampling might prove of serious consequence.

Later when steel drums, in which the filling hole might be on the end, were introduced and the filled drums were often stored in the factory in an upright position, with the result that the solid fraction would accumulate at one end of the drum, the method of rolling the container previous to sampling was abandoned and a sampling tube method suitable for different sized containers was devised.

The most satisfactory method of drawing a representative sample of palm oil from a container is to remove, as it were, a core of oil from top to bottom of the container, thereby including the correct proportions of solid and liquid fractions.

Various forms of sampling tubes can be employed for this purpose. One type, which is similar in design to a grain sampler, is a metal instrument which consists of two concentric tubes closely fitted into each other along their entire length, so that one tube can be rotated within the other. A longitudinal opening of about one-third of the circumference is cut in both tubes. In one position the tube is open and admits the oil. By turning the inner tube through 180° the instrument becomes a sealed container.

Another type consists of a semi-circular metal tube, which is open or closed by means of a shutter which moves up and down the entire length. This type has the advantage that samples can be drawn up to varying heights from the bottom of the container.

In both cases, the closed tube is lowered till the bottom of the container is reached. The instrument is opened so as to admit the oil, closed again and withdrawn.

The machining of a long length of metal tube to ensure an oil-tight joint was found to be a somewhat difficult task, and a simpler and less expensive form of sampling tube was therefore devised.

A length of iron pipe, about one foot longer than the depth of the container, is cut, and one end faced to fit a conical plug suspended inside the tube by means of a thin iron rod. The diameter of the tube must be chosen to allow of its being inserted without any difficulty through the filling hole of the container.

The iron rod is in two parts, which are joined together by a short length of steel spring. The upper end of the rod is fitted with a short cross-bar which enables the plug, when the spring is in tension, to be drawn up tightly against the

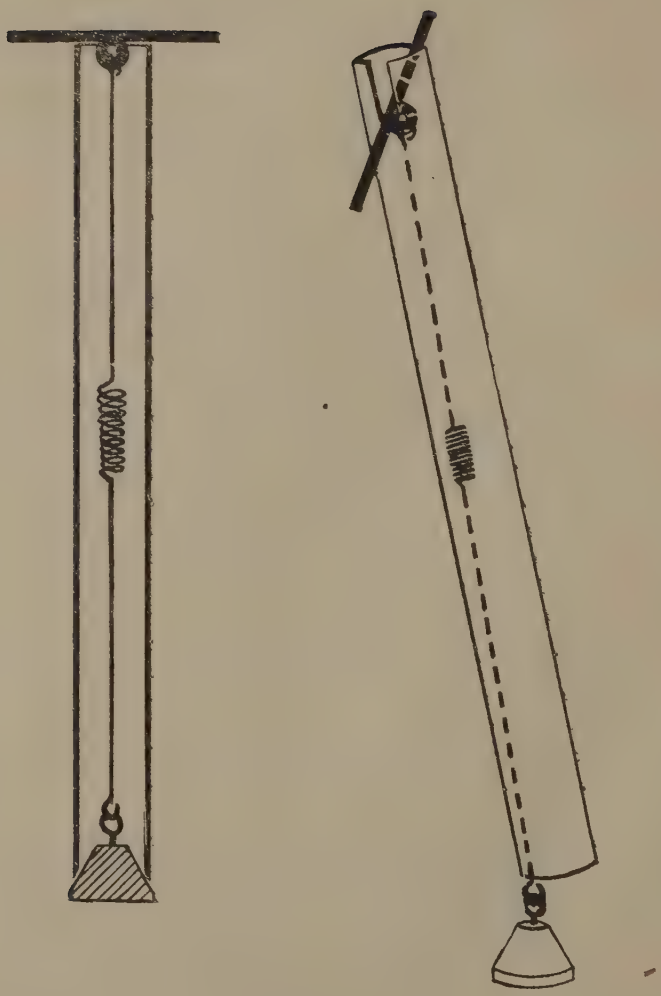

Diagram I.
Sampling Tube.

lower end of the tube. A slot is provided at the upper end of the tube into which the cross-bar fits, when the spring is released. In this position the plug hangs clear of the lower end of the tube. The sampling tube is illustrated in Diagram I.

The tube is inclined very slightly to prevent the plug from obstructing the lower end, after which it is lowered very slowly into the container. When the bottom has been reached, the plug is moved into position by means of the cross-bar at the upper end. The filled tube can then be withdrawn from the container.

This form of sampling tube was tested at the Central Experiment Station, Serdang, with satisfactory results. Four freshly filled drums of oil were sampled, the drums were then left undisturbed for a month, when a second set of samples was taken. Table II gives the results obtained.

Table II.

Results of Tests with Locally Made Sampling Tube.

Serial No. of Drum.	Acidity of Oil (calculated as palmitic acid)		Increase of Acidity of Oil on Storage.
	Fresh Oil	Stored Oil	
	per cent.	per cent.	per cent.
No. 1	3.41	3.63	0.22
No. 2	3.40	3.57	0.17
No. 3	3.45	3.61	0.16
No. 4	3.37	3.51	0.14
Average	3.41	3.58	0.17

The figures for the individual samples of both fresh and stored oil are in good agreement, those for the increase in acidity being also normal.

In the case of large tanks, *e.g.* ships' tanks, a sampling tube becomes cumbersome and another method has been adopted. This method is, however, only applicable in cases in which the oil is a homogeneous liquid.

Stored palm oil which has been re-melted *in situ* by the application of heat is not a homogeneous liquid. To ensure homogeneity of the re-melted oil in a tank or even a small container, the oil in the tank must be circulated by means of a pump, or the container itself shaken vigorously.

The necessity for mixing can be illustrated by the following experiment. If the oil in a bottle in which the two fractions have separated is re-melted by standing the bottle in a bowl of hot water, the two layers of liquid and re-melted solid fraction respectively can be discerned by inclining the bottle slightly. The original

liquid fraction will appear to float on the lower layer of the re-melted solid fraction, and vigorous end-to-end shaking of the bottle is necessary before the oil in the bottle becomes homogeneous again.

In the case of bulk shipments the melted oil from the storage tank is pumped, frequently for a considerable distance, to the ship's tanks into which the pump still delivers it with a certain amount of force, the end of the pipe line having to be kept only a short distance above the level of the oil in the tank to prevent excessive splashing. In view of the turbulence the oil can be assumed to be homogeneous when delivered to the ship.

Sampling in such cases is carried out by means of an instrument known as a stealer jar.

The stealer jar consists of a cylindrical iron pot, which is weighted at the bottom with sheet lead to facilitate sinking. A hole is drilled in the bottom of the pot, into which a narrow iron pipe is fixed, the pipe extending to within one inch of the top of the pot.

A cover is provided, which is fastened securely by means of a clip on either side of the pot. A narrow bent iron pipe is fixed in the cover, also a hook to which a cord is fastened for raising or lowering the jar. Diagram II illustrates such a jar.

The principle upon which the jar works is that as it is lowered into the tank oil is forced into the pot from the bottom, the displaced air escaping through the bent pipe in the cover.

To obtain comparable samples the speed at which the jar is lowered and raised must be regulated. This is done by ensuring that when the jar has been lowered to the bottom of the tank and raised again to the surface the level of the oil in the jar is always approximately half an inch from the top of the tube.

If the jar is lowered slowly, oil will be overflowing when the jar is raised to the surface. Similarly, if lowered too quickly the pot will be found to be only half full when raised to the surface again.

The method was tested at Singapore with satisfactory results. Two tanks, each holding about 370 tons of oil, were used in the test. Six samples of oil were drawn from each tank, the points of sampling being spaced at equal distances along two sides of the tank. Table III gives the results of the experiment.

In both cases there is good agreement between the acidity figures for the individual samples of oil.

Suggested Methods for Sampling on Estates.

Methods of sampling will vary according to whether the oil is being despatched (a) in drums or (b) in bulk. Before considering each case in detail there are certain essentials common to both methods and to which attention should first be drawn.

Every effort should be made to ensure, as far as possible, an oil of uniform quality, which also meets with requirements of the shippers. This is probably of greater importance to estates exporting oil in drums than to those exporting in bulk.

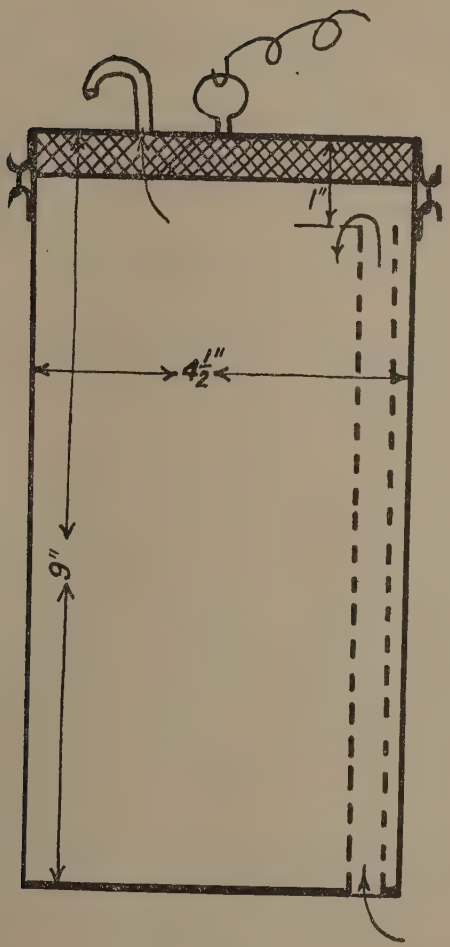

Diagram II.
Stealer Jar.

Table III.

Results of Tests with Stealer Jar.

Serial No. of Sample.	Acidity of Oil (calculated as palmitic acid)	
	Tank No. 1	Tank No. 2
	per cent.	per cent.
No. 1 ...	4.75	4.45
No. 2 ...	4.70	4.43
No. 3 ...	4.75	4.43
No. 4 ...	4.62	4.39
No. 5 ...	4.72	4.45
No. 6 ...	4.67	4.38
Average ...	4.70	4.42

When a consignment of oil in drums is sampled, only a proportion of the drums is chosen. If there are considerable variations in acidity and the oil in some drums exceeds the maximum allowed by the contract, there is always the chance that such drums may be selected by the buyer with the result that the estate will be penalized even though the average acidity of the whole consignment based on samples drawn from all the drums meets the requirements of the contract.

In the case of a large estate exporting in bulk, daily variations in acidity tend to be evened out and a more uniform product thereby ensured as a result of the output of oil being bulked in a large storage tank, which may hold as much as 100 tons.

In this connexion it may be mentioned that when palm oils of varying acidities are mixed, the acidity of the mixture can be calculated, knowing the individual acidities and the proportions in which they are present. Thus, 60 tons of oil of 4 per cent. acidity mixed with 10 tons of oil of 6 per cent. acidity will yield 70 tons of oil of 4.3 per cent. acidity.

When collecting a bulk sample from which a representative sample for analysis will be drawn, the samples drawn from the different containers must be mixed together in the same proportions as exist between the amounts in those containers. For example, in the case of drums or motor lorry tanks the same amount of oil must be drawn on each occasion that the drum or tank is filled. The individual samples can then be bulked and a representative sample of oil from the mixture drawn for analysis.

(a) *Small Estates Despatching in Drums.*—On a small estate, sampling of the oil can be combined with the filling of the drums. The following procedure is suggested. A number of empty bottles are washed, dried and labelled. Two bottles are required for a day's output of oil. Half-way through the filling of each drum from the mechanical separator two small measures of oil, say one ounce, are drawn. The same amount of oil must be drawn on each occasion. These two samples of oil are placed in the two bottles referred to above. At the end of the day's run the acidity of the oil in one bottle is determined, the balance of the oil being returned to the plant. The figure for the acidity, together with the corresponding serial numbers of the drums, is entered on the label of the duplicate bottle, which is retained.

When the contract has been filled a representative sample of oil for analysis can be obtained by mixing the melted oil from the appropriate bottles in another container. As many sample bottles of oil as are required can then be drawn from the mixture.

If, however, the contract specifies that only a proportion of the containers shall be sampled, serial numbers being also indicated, samples may be drawn by means of the sampling tube previously described. The samples from the individual containers are bulked in a vessel, for example a four-gallon kerosene tin, the oil melted, stirred to ensure thorough mixing and the requisite samples for analysis taken.

Provided an oil of uniform quality below the limit of the contract can be assured, a storage tank on a small estate is, therefore, only required in cases of emergency, for example for storing oil in which, owing to unforeseen circumstances, the acidity exceeds the maximum.

When normal working conditions, resulting in the production of oil of lower acidity than is called for by the contract, have been resumed, this high acidity oil can be gradually absorbed by mixing a proportion with the daily output from the factory, while keeping the acidity of the mixed oil below the maximum.

(b) *Large Estates Despatching in Bulk.*—Although a storage tank is installed on every estate despatching oil in bulk and the factory records will show the acidity of the total oil in the tank, in the absence of proper mixing facilities this figure can only be relied upon as an approximate indication of the acidity of any proportion of the oil which may be drawn off.

It is preferable, therefore, to sample each container filled from the tank, to bulk the individual samples, and to draw from the mixed oil the representative sample for analysis.

There is an alternative method, namely to install a small side tube in the main pipe leading from the tank. This tube is kept open while the oil is passing along the pipe line, and the oil collected from the side tube forms the sample.

This method is, however, only applicable in those cases in which the oil can be circulated with sufficient turbulence to ensure satisfactory mixing. Further, care must be taken to ensure that the tube does not become choked while delivery of the oil is in progress, also to maintain a regular flow of oil during the whole

operation. As regards the second condition, it would not be possible, for example, to rely upon the accuracy of a sample taken from a pipe line along which the oil is being drawn by means of a suction pump. The action of the pump would be to draw the oil past the side tube too rapidly, thus not allowing it to function properly.

When despatching oil in bulk from an estate three types of containers must be considered separately or in combination: (i) tank on motor lorry, (ii) railway tank wagon, (iii) tank on small coasting vessel.

(i) *Tank on Motor Lorry.* Provided the oil in the storage tank has been completely liquefied and the tank on the lorry is filled rapidly with a fair amount of turbulence, a satisfactory sample may be drawn by dipping a small iron pot, 4 ozs. capacity, into the oil. If, however, there should be any doubt as to adequate mixing, sampling may be left until the lorry arrives at its destination, when the oil may be assumed to have been thoroughly mixed. In such cases the individual samples would be bulked in a large vessel and the representative sample drawn for analysis.

(ii) *Railway Tank Wagon.* If the tank wagon is filled direct from the storage tank on the estate it is suggested that a sample be drawn by using a tube of the type previously indicated. This method can also be used in cases in which the tank wagon is filled from the motor lorry tank, only one sample being drawn when the former container has been filled.

(iii) *Tank on Small Coasting Vessel.* Provided the oil in the tank is completely liquid and the tank has been filled with a fair amount of turbulence, a stealer jar may be used. If, however, the oil is semi-solid, the only alternative is to use a sampling tube of the type previously indicated.

If there are several tanks on the vessel and only an average acidity figure for the whole shipment is required, care must be taken to ensure that the bulk sample is composed of amounts of oil from each tank in proportion to the weights of oil in those tanks. This point has been referred to previously.

Sampling at Bulking Stations.

The foregoing remarks regarding sampling on estates despatching in bulk may be held to apply equally to a bulking station receiving the oil, the only difference being the much larger amount of oil stored or shipped at the station compared with the estate.

Provided satisfactory sampling methods are adopted both by the estate and the bulking station, there should be a good agreement between the two sets of figures.

In conclusion, the writer would like to draw attention to the paramount importance of satisfactory sampling at all stages between the estate and shipment on the ocean-going steamer. Time and trouble spent on drawing representative samples at each stage will be more than repaid later when the oil is despatched. If representative samples are taken, the differences of 0.5 per cent. in acidity which it is understood are often found between the figure as calculated at the station and as determined by the analyst should be reduced to negligible amounts.

Acknowledgments.

The writer wishes to acknowledge the assistance of Messrs. W. Taylor and T. D. Doig, Government Factory, Kuala Lumpur, in designing the sampling tube. He is also indebted to Mr. I. Sibiriakoff, Socfin Co. Ltd., Kuala Lumpur, for the loan of a diagram of a stealer jar, and to Inche Nuruddin bin Maruf, Malay Agricultural Subordinate, for reproducing the diagram.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

3rd Quarter, 1937.

Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S. in collaboration with the Field Branch of the Department.

Rainfall.

All reports indicate the abnormally dry weather experienced in the first two months of the quarter, the drought in most cases continuing until the second half of September when normal rainfall was recorded.

Prices.

The lowest and highest prices paid for small-holders' rubber, together with the means of the extremes are given in Tables I and II. Prices were on a lower level than in the previous quarter, but remained relatively stable.

Production.

Production on small holdings during the year is summarized in Table III, which shews clearly the increase which has taken place in comparison with last year. This table is compiled from the monthly reports of production, stocks, imports and exports of rubber, published by the Registrar-General of Statistics, S.S. and F.M.S.

Tapping.

Table IV shews the estimated acreages of rubber on small holdings out of tapping at the end of the quarter. Table V summarizes the totals in comparison with the previous quarter and with the third quarter of 1936.

These figures are arrived at by a quarterly survey of small holdings, estimates being calculated by counting the number of holdings out of tapping in a certain area and applying the percentage to the total area of small holdings in the relative District.

A study of Table V shews the further considerable drop in areas out of tapping during the quarter under review; particularly noteworthy is a comparison of September 1936 and September 1937 figures for the whole of Malaya, 382,217 and 149,100 acres respectively out of tapping.

This increase in tapping is probably partly due to the decrease in the price of coupons with the consequent increase in the value of uncouponed rubber. One report states that coupons fell to $9.30 per picul equivalent in August but improved to $12.50 in September, the increase being due to dealers endeavouring to balance stocks at the end of the quarter.

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

3rd Quarter 1937.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JULY					
Smoked sheet	36.50-40.00	32.00-40.40	33.00-39.30	33.00-40.00	32.75-40.20	37.50-39.50	36.00-42.50	34.00-41.00
Unsmoked sheet	35.00-39.00	29.60-39.00	28.00-36.00	32.00-38.00	30.20-38.90	36.50-37.50	30.50-38.00	32.00-39.20
Scrap	19.00-27.00	10.00-27.00	21.00-27.00	—	19.00-26.00	22.50-28.00	22.00-32.00	17.50-28.00
			AUGUST					
Smoked sheet	34.50-39.10	24.00-39.80	34.00-38.00	34.00-38.00	30.00-38.00	36.00-38.50	35.00-39.00	31.00-37.90
Unsmoked sheet	34.00-38.80	22.00-37.00	29.00-36.00	31.00-35.50	29.00-37.00	34.00-36.50	30.50-36.50	27.00-37.30
Scrap	18.00-26.50	10.00-24.00	18.00-23.00	—	18.00-23.00	21.50-26.00	20.00-36.00	16.00-29.00
			SEPTEMBER					
Smoked sheet	36.50-40.20	33.00-38.70	33.00-38.00	33.60-38.40	32.00-38.00	36.50-38.50	36.00-39.50	35.70-38.00
Unsmoked sheet	35.00-38.50	28.00-37.20	28.00-36.00	31.50-35.50	29.60-37.20	34.50-36.50	30.50-36.50	29.00-37.40
Scrap	20.00-26.00	8.00-23.00	15.00-25.00	—	19.00-23.00	21.50-27.00	20.50-37.00	14.00-25.00

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul (133 1/3 lbs.))

3rd Quarter 1937.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JULY					
Smoked sheet	37.33-39.00	35.58-38.25	35.35-37.40	34.67-39.15	34.79-38.44	37.66-38.83	36.50-39.30	36.40-39.06
Unsmoked sheet	36.00-38.12	32.00-35.11	32.00-34.35	33.00-36.80	32.92-36.74	36.50-37.16	32.90-36.90	34.59-37.59
Scrap	22.50-24.75	16.50-18.50	21.00-25 00	—	20.50-23.00	24.83-25.83	23.20-27.30	21.44-25.90
			AUGUST					
Smoked sheet	37.28-39.42	34.31-36.45	35.58-36.92	34.94-37.36	33.37-36.27	37.00-38.33	35.70-38.16	35.13-37.00
Unsmoked sheet	35.25-37.95	30.56-33.26	31.25-33.50	32.20-34.95	31.50-34.08	35.00-36.33	32.80-35.40	31.54-34.46
Scrap	21.75-24.38	17.00-18.66	20.00-21.50	—	19.50-21.25	22.83-24.50	21.60-25.00	19.50-21.78
			SEPTEMBER					
Smoked sheet	37.98-39.24	35.07-37.12	35.75-37.11	35.46-38.04	34.18-36.67	37.16-38.00	36.40-38.74	36.06-37.27
Unsmoked sheet	35.80-38.00	31.65-33.82	31.38-34.25	32.40-35.20	31.52-34.08	35.50-36.16	32.90-36.00	33.47-35.50
Scrap	22.50-24.75	16.50-17.83	19.00-22.00	—	20.00-22.85	23.83-24.66	21.90-27.40	18.79-21.53

Table III.

Production of Rubber on Small Holdings

(in tons)

	Total Jan.-Sept. 1936	1st Quarter 1937	2nd Quarter 1937	3rd Quarter 1937	Total Jan.-Sept. 1937
Federated Malay States ...	45,341	19,764	19,975	26,253	65,992
Unfederated Malay States ...	40,424	19,310	18,568	21,446	59,324
Straits Settlements ...	9,261	3,769	4,198	4,727	12,694
Total ...	95,026	42,843	42,741	52,426	138,010

Condition of Holdings.

Reports indicate that a reasonable standard of upkeep is being maintained on most small holdings. In Penang an intensive campaign against clean weeding on hillsides was started with the assistance of the Collector of Land Revenue, and the Asiatic Rubber Instructor was very busy instructing in the use of ground covers. In Malacca, with the arrival of an additional Asiatic Rubber Instructor (Chinese) it is hoped that the improvements recorded on holdings will be extended to those owned by Chinese.

From Negri Sembilan it is reported that high tapping may still be seen in some districts, and tapping knives are lashed to long bamboo handles.

Diseases.

Mouldy Rot was controlled to some extent by the dry weather, but several outbreaks were reported, particularly with the wetter weather of September. Large quantities of approved disinfectants were sold through Field Officers.

During September a suspected outbreak of *Oidium Heveae* was reported from the Segamat District of Johore, but the disease was in a mild form only and was confined to a few areas.

Root diseases are prevalent in various parts of the Peninsula, but are receiving increasing attention from small-holders with the improvement in their economic conditions. A few mild cases of Pink Disease were mentioned in one report.

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of September, 1937.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	36,187	3,300	9	Klang	16,143	2,300	14	Seremban	23,639	12,500	53	Raub	10,534	1,500	14
Kinta	38,874	2,300	6	Kuala Langat	23,881	2,900	12	Tampin	21,896	3,900	18	Kuala Lipis	15,457	800	5
Kuala Kangsar	92,166	6,500	7	Ulu Langat	45,012	7,700	17	Kuala Pilah	31,832	13,700	43	Bentong	12,224	1,000	8
Upper Perak	15,590	1,600	10	Ulu Selangor	31,463	3,100	10	Jelebu	9,097	800	9	Other Districts†	46,373	4,200	9
Larut & Selama	43,132	3,500	8	Kuala Lumpur	20,277	3,000	15	Port Dickson	11,133	4,200	38				
Krian	9,408	6,200	66	Kuala Selangor†	8,417	1,200	14								
Lower Perak*	26,735	3,500	13												
Dindings	9,873	6,400	65												
	271,965	33,300	13		145,193	20,200	14		97,597	35,100	36		84,588	7,500	9

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	14,093	1,800	13	North	3,549	100	2	Singapore	20,115	600	3
Alor Gajah	30,838	600	2	Central	10,785	2,300	21				
Jasin	25,286	3,300	13	South	8,936	900	10				
				Penang	15,822	600	4				
	70,217	5,700	8		39,092	3,900	10		20,115	600	3

JOHORE	350,007	28,700	8
KEDAH	102,126	10,200	10
PERLIS	2,916	3,900	12
KELANTAN & †	49,133		
TRENGGANU	29,836		

The percentage of areas out of tapping in June, 1937, was as follows:—Perak 14, Selangor 15, Negri Sembilan 41, Pahang 18, Malacca 13, Penang and Province Wellesley 11, Singapore 1, Johore 15, Kedah 16.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

Table V.

Comparison of Areas of Rubber Small Holdings Out of Tapping.

	September, 1936		June, 1937		September, 1937	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S.	213,795	39.6	104,600	19.4	96,100	16.0
S. S.	26,422	21.3	13,200	10.7	10,200	7.9
U.M.S.	142,000	28.4	77,500	15.5	42,800	7.9
Malaya	382,217	32.8	195,300	16.8	149,100	11.7

General.

A 30 acre holding in Johore which was budgrafted at the end of 1936 continued to make excellent progress, and another application from the same district for budwood has been received. Recently budded holdings in Perak South are also reported as proceeding satisfactorily.

A number of smoke cabinets have been erected, and, generally speaking, cabinets are proving successful in districts where a satisfactory premium can be obtained for smoked sheet.

In South Pahang the Asiatic Rubber Instructor made a successful attempt to grade and sell rubber on co-operative lines. A suitable premium was obtained for the improved quality sheet.

Reviews.

Domestic Preservation of Fruits and Vegetables.

Bulletin No. 21 of the Ministry of Agriculture and Fisheries. Published by His Majesty's Stationery Office, London, W.C. 2. 89 pp. 22 figs. Price 1s. net (board covers 1s. 6d. net) postage extra.

The first edition of this bulletin was published in 1929, while the present edition is the fifth—sufficient proof that the volume has met a demand for information as to the best methods by which fruits and vegetables can be preserved.

Among subjects discussed are the principles of preservation, fruit bottling and canning, principles and practice of jam-making from fresh fruit, preparation of fruit syrups, preservation of vegetables, examination of home made foods before use, and drying of fruit and vegetables. In addition, numerous recipes are given for jams, jellies, marmalade, chutneys and pickles. Many of these recipes are concerned with temperate-climate fruits and have therefore little or no application to tropical conditions, but apart from the recipes there is such as mass of other useful information in the compass of these 89 pages that the book should be useful alike to the housewife and for those who contemplate taking up canning or bottling as a small commercial enterprise.

Malaya already possesses an important industry in canned pineapple, but there should be scope for commercialization of other local canned or bottled fruits and vegetables and as an introduction to the subject this bulletin should prove of great value.

Of particular interest are the few pages devoted to the home canning of fruits. It is now possible to can fruits at small expense, for a canning machine costs between £4 and £5 and cans are from 24s. 6d. to 27s. 6d. per gross, according to size. Therefore the outlay for those who contemplate marketing of canned fruits is not great. It is possible that there are many fruits in Malaya suitable for bottling or canning. The more general adoption of these forms of preservation might solve the difficulty so often experienced of marketing the produce at a profitable figure, for by preservation one overcomes the frequent disadvantage of distance from market, while greater benefit accrues from seasons of heavy crops.

The science of bottling and canning fruits has made great strides during the past few years and it is largely due to this successful research work that public confidence has been gained, for the consumer is assured, as we are reminded in the Foreword to this book, that correctly preserved fruits and vegetables are perfectly satisfactory foods, retaining the nutritive value of the fresh materials.

D. H. G.

Journal of Coconut Industries.

Vol. I, No. 1, September, 1937. Published by the Ceylon Coconut Board, Colombo, quarterly. 96 pp. Price 50 cents (Ceylon Currency).

In the preface to this new quarterly publication, the editor explains that "the purpose of the Journal is to give useful information to persons interested in coconut industries". The Journal is in fact concerned almost entirely with the Ceylon coconut industries and is produced in the hope—to quote the preface once more—"that coconut-producing countries will obtain . . . . . an idea of the organised efforts made in Ceylon for the improvement of the Coconut Industry in general and for the marketing and exportation of coconut products".

If future numbers maintain the standard of this first number these objects should be adequately achieved. The title of the Journal, however, implies a more comprehensive publication. The subjects treated are concerned almost entirely with the Ceylon coconut industries, a fact which is not evident from the title of the Journal.

The first number consists of 96 pages, twenty-nine of which are advertisements backing on "solid matter" so that the advertisements must be included in the bound volume. This may be of value to advertisers but is unpopular with librarians, whose shelves, in these days of multiplicity of agricultural periodicals, fill all too rapidly.

One further criticism: while a comprehensive list of names and addresses of auctioneers and brokers is given which is useful for those wishing to enter into trade relationships, it is followed by a list of nearly 900 names of dealers, without their addresses, which surely must be valueless.

Despite these criticisms, the Journal offers the reader good value for money for it is a useful addition to literature on this crop. Ceylon claims to possess 15 per cent. of the world's total acreage under coconuts, and is the second largest exporter of coconut products. A regular and comprehensive study of the position of the industry in that country, such as is offered by the present publication, will be welcomed by those in other countries who are interested in this crop.

D. H. G.

Plantation Crops.

Published for the Imperial Economic Committee by His Majesty's Stationery Office. 104 pp. September 1937. Price 2s. 9d. post free.

The Intelligence Branch of the Imperial Economic Committee has published a summary of figures of production and trade relating to sugar, tea, coffee, cocoa, spices, tobacco and rubber. This review is one of a series designed to present, in a convenient form, summaries of production and international trade for a group of allied commodities, with special reference to the part played by the countries of the British Commonwealth of Nations. Tea, coffee, and cocoa were the subjects of previous reports of the Committee. The present review provides an opportunity of bringing up-to-date some of the statistics contained in these Reports.

RUBBER TECHNOLOGY CONFERENCE 1938.

The Council of the Institution of the Rubber Industry is arranging a Conference to be held in London during May 1938. It is announced that the Rubber Division of the American Chemical Society is willing to support the Conference and invitations are also extended to rubber technologists in all countries.

In order that the Conference may meet with a definite object in view, the Council has decided that the principal part shall be a Symposium on Methods of Improving and Evaluating the Durability of Rubber.

To avoid confining the Conference within too narrow limits, however, and to provide for the interests of those whose work is not directly concerned with the subjects of the Symposium, the second part of the programme will be devoted to general subjects.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

October, 1937.

The Weather.

The main deviations from the frequent and heavy rains normal nearly everywhere for October are noted below.

In Kedah, although the rainfall was frequent, the total precipitation for the north-eastern portion of the State was considerably below the average for the month.

Precipitation was considerably below normal in Lower Perak and at Tanjong Malim.

In Selangor the weather was unusually dry for the first half of the month, and the total rainfall figures are well below average except in the Klang and Kuala Langat areas. Very little rain fell in the Tanjong Karang area during the month.

In Malacca the rainfall was well distributed but comparatively light, and total figures recorded are below the average.

In the Seremban, Tampin and coast areas of Negri Sembilan the rainfall was above average for the month, but elsewhere in this State remarks made above on Malacca apply.

In Kelantan, distribution was uneven, most of the rain falling during the first and last weeks of the month. Total precipitation was generally below normal for the month.

Remarks on Crops.

Padi.—With adequate water at last available, the padi fields in Kedah, Province Wellesley and Krian were scenes of great activity throughout the month in an endeavour by the cultivators to complete planting as soon as possible. In some areas, however, it is obvious that it will be impossible to finish the operation before the beginning of the Mohammedan fasting month which commences on November 5th. Even in the most forward localities planting was later than what experience has shown to be generally the optimum time, and the planting in the most backward areas was often done perforce with plants that had been weakened through too long a nursery period and on land cultivated too recently to allow of proper rotting of the cut vegetation. The prospects of the crop in Kedah are made still worse by the fact that the fungus diseases which damaged much of the crop last season have reappeared in some areas. Through much of north-west Krian the crop looks fairly promising but is very backward and irregular in the south-east of the District. Prospects are good in Penang where conditions allowed planting to be done up to time under fairly good conditions of water supply.

The crop is generally late in the Larut, Upper Perak and Kuala Kangsar Districts of Perak.

In the Sungei Manik area of Lower Perak prospects are generally more promising than last season, especially throughout Stage I of the area. In the Panchang Bedina and Tanjong Karang areas of Selangor dry weather has somewhat delayed planting, but there is now sufficient water over much of Panchang Bedina to enable planting to be done. Although this is very late by ordinary standards, experience has shown that the fertile soil enables a fair crop to be produced when planted at this time of year, given fairly suitable growing conditions and freedom from rat damage.

Crop prospects are fairly good in Negri Sembilan and in Malacca, although in Malacca planting was rather later than usual.

In Pahang the dry weather of August and September has had a bad effect on the crop in the down-river and road mukims of Lipis District, but prospects are fairly good elsewhere except in Temerloh District where the planted area is reported to be much smaller than last season.

In Kelantan, prospects for both dry and wet padi are better than last season.

Agricultural Stations.

The most noteworthy item in connexion with Agricultural Stations is the marked development that has taken place during the course of this year in the matter of fruit improvement. It is evident from both monthly reports and from personal observation that there has been a general effort to tackle this problem in a sound and practical manner. Though few Agricultural Stations are yet in a position to supply reliable budded planting material in any great quantity, on many of them there have been planted young budded trees of known good quality durians, rambutans, pulasans and avocado pears to provide budwood for the future. (To avoid misunderstanding it should be mentioned that the Central Experiment Station, Serdang, is in a position to supply reliable budded planting material in quantity). In a few cases these have been planted solely for the provision of budwood, and therefore much closer than would have been the case had they been intended to remain to develop into full-grown specimens. In this connexion it is worth noting that the Central Experiment Station, Serdang, has adopted the plan of planting such material in rows at about 5 feet apart, the rows themselves being spaced at about 10 feet.

The position with regard to poultry is not so satisfactory. Reports of losses from disease are still fairly common from many Stations and the flock in most cases is too small in numbers to allow of forming even one good breeding pen of uniform age. The aim should be in any administrative unit first to obtain two breeding pens of uniform age at one Station and then to stock other Stations from it. Further experience tends to confirm the view that excessive trouble from disease is generally due either to wrong feeding or wrong management in one or more respects.

DEPARTMENTAL NOTES.

Visit of Sir Frank A. Stockdale, K.C.M.G., C.B.E.

Sir Frank A. Stockdale, Agricultural Adviser to the Secretary of State for the Colonies, has been invited, and with the approval of the Secretary of State has accepted the invitation, to visit Malaya in 1938.

It is expected that Sir Frank will arrive at the end of January and will stay for about one month in this country during which time he will visit all the important centres of agricultural interest in the Colony and in both the Federated and Unfederated Malay States.

Sir Frank Stockdale was for some years Director of Agriculture, Ceylon, and has served in or subsequently visited in his present official capacity most of the British Colonies, but this will be his first visit to Malaya. The visit will be of value to the Malayan Governments as well as to the Director of Agriculture, Straits Settlements, and Adviser on Agriculture, Malay States, and his officers.

Tamil Agricultural Journal.

In view of the large number of Tamils in Malaya engaged in agriculture, and in response to requests from representative bodies, two numbers of a new Tamil Agricultural Journal, printed in Tamil, have been published by the Department of Agriculture, S.S. and F.M.S. Considerable experience has been gained by the production of these two numbers of the type of article for which there is a demand and the class of reader who is likely to be interested in the Journal.

It cannot be claimed, however, that the Journal has proved an unqualified success and one must retain an open mind concerning its future.

The third number of the Journal has just been issued in which several improvements have been incorporated. It is hoped that Tamil proprietory planters and all employers of Tamil agricultural labour will examine the present issue and consider how far it can be made of use in their sphere. The Department will be glad of any suggestions which it is thought would increase the usefulness of the Journal.

The Tamil Agricultural Journal will be sent free to any applicant who has an active interest in Malayan agriculture.

Rural Lecture Caravan.

The Rural Lecture Caravan visited nine centres in the Raub and Lipis Districts during the early part of October, and commenced a tour in the Kuala Pilah and Rembau Districts on the 24th October.

Statistical.

MARKET PRICES.

October, 1937.

Major Crops.

Rubber.—The month saw a very heavy fall in rubber prices, the difference between highest and lowest quotations being $4\frac{7}{8}$ cents per lb. Spot loose opened at $28\frac{1}{2}$ cents per lb. and early improved to $28\frac{7}{8}$ cents. There followed a steady weakening to $24\frac{3}{8}$ cents on the 20th, and, after a slight hardening, a further fall to 24 cents on the 27th and 28th, improving to close at 25 cents.

The average price for the month for No. 1. X. Rubber Smoked Sheet was 26.28 cents per lb. as compared with 30.16 cents in September. The London average price was 7.87 pence per lb. and the New York price 16.27 cents gold, as compared with 8.95 pence and 18.49 cents gold in September.

Table I shews prices paid for small-holders' rubber at three centres during the month.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, October, 1937.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.			
	7	14	21	28	6	13	20	27	6	13	20	27
Smoked sheet	34.00			28.54	34.00	32.34	30.00	29.88				
Unsmoked sheet	32.00	30.69	30.80	27.00					30.00	27.20	25.50	25.40
Scrap			18.20									

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

Palm Oil.—Table II shews October prices for the Malayan commodities. It will be seen that the market shewed a slight upward trend until the close of the month.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1937.	Palm Oil in Bulk, c i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
October 1	£ 18. 0. 0	£ 10. 17. 6
„ 8	18. 5. 0	11. 0. 0
„ 15	18. 10. 0	11. 0. 0
„ 22	18. 10. 0	11. 0. 0
„ 29	18. 2. 6	10. 15. 0

Copra.—After an improvement in the first few days of October, the Singapore market weakened steadily with the exception of a slight recovery in the middle of the month. The sun-dried grade opened at $5.60 per picul and rose immediately to $5.70; it fell to $5.25 on the 7th and improved to $5.60 on the 16th; thereafter it again weakened, falling to $5.05 on the 26th, but rose to close at $5.25. The average price for the month was $5.36 per picul as compared with $5.14 in September. The mixed grade averaged $5.11 per picul as compared with $4.88 in September.

Copra cake was quoted throughout the month at $2.40 per picul.

Rice.—The average wholesale Singapore prices of rice per picul in September were as follows:—Siam No. 2 (ordinary) $4.57, Rangoon No. 1 $3.92, Saigon No. 1 $4.12, as compared with $4.79, $3.92 and $4.12 in August, and $3.75, $3.47 and $3.77 in September 1936.

The average retail prices in cents per gantang of No. 2 Siam rice in September were: Singapore 34, Penang 37, Malacca 34, as compared with 29, 40 and 34 in August.

The average declared trade value of imports during September was $4.20 per picul, as compared with $3.97 in August and $3.78 in July.

Padi.—The Government Rice Mills, Perak, continued to pay $2 per picul for padi. Retail prices ranged from 7 to 16 cents per gantang.

Pineapples.—At the close of the month prices were lowered slightly and enquiry from the United Kingdom is not sufficiently strong to hold out hopes for any early advance. Average prices per case were as follows: G.A.Q.: Cubes $3.08,

Sliced Flat $2.99, Sliced Tall $3.14; Golden Quality: $3.32, $3.34 and $3.44 respectively.

Prices of fresh fruit per 100 during October were as follows:—Selangor 60 cents to $1.20; Singapore $1.10.

Beverages.

Tea.—Seven consignments of Malayan tea were sold on the London market during October. Only one was of upland tea and sold at an average price of 1s. 3¾d. per lb. The lowland tea averaged from 1s. 2¼d. to 1s. 3d. per lb.

Average London prices per lb. during October for consignments of tea from other countries were as follows:—Ceylon 1s. 4.87d., Java 1s. 3.06d., Indian Northern 1s. 4.12d., Indian Southern 1s. 3.48d., Sumatra 1s. 1.16d.

The latest Colombo average prices available quoted from *The Weekly Tea Market Report,* 26th October, 1937, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 78 cents, Medium Grown Teas 75 cents, Low Grown Teas 73 cents.

Coffee.—Prices were again slightly lower in Singapore during October and averages per picul for the month were:—Sourabaya $13.12 to $14.12, Palembang $10.25 to $11.25. The September averages were $12.81 to $14.81 and $10.69 to $12.75 respectively.

Prices in Singapore of other varieties of coffee were as follows (per picul):—Liberian $18, falling to $15; Excelsa $12, falling to $11 but recovering to $12 again; Robusta $10, falling to $8.

Spices.

Arecanuts.—The following was the range of Singapore average prices per picul during October:—Splits $5 to $8.56; Red Whole $6.12 to $7.19; Sliced $8.31 to $9.31.

The averages of the Singapore Chamber of Commerce quotations per picul were:—Best $8.39, Medium $7.98, Mixed $7.47.

Pepper.—Prices fell back during October with lack of buying enquiry. Average prices per picul were:—Singapore Black $9.65, Singapore White $15.30, Muntok White $15.80, as compared with $11, $16.75 and $17.25 respectively in September.

Nutmegs.—Both 110's and 80's were quoted throughout the month at $40 per picul, as compared with an average price of $39.25 in September.

Mace.—Siouw improved to $110 per picul, averaging $108 per picul, and Amboina improved to $88, with an average of $87.40. The September average prices were $100 and $85 per picul respectively.

Cloves.—Quotations remained nominal and unchanged at $40 per picul.

Cardamoms.—Quotations for green cardamoms in Ceylon Chamber of Commerce reports for October opened at Rs. 2.15—Rs. 2.30 per lb. and closed at Rs. 2.10—Rs. 2.27 per lb.

Miscellaneous.

Derris (Tuba Root).—With absence of demand, Singapore prices fell still further during October. Roots sold on rotenone content averaged $31 per picul, and roots sold on a basis of ether extract averaged $18 per picul, as compared with $38 and $20 respectively in September.

Gambier.—Block fell to $8.75 per picul, averaging $9.40 for the month, and No. 1 Cube averaged $15.30 per picul. The September average prices were $9.35 and $15.25 respectively.

Tapioca.—Average prices per picul in Singapore for October were:—Flake Fair $5.16, Seed Pearl $5.22, Medium Pearl $5.56, as compared with $5.08, $5.20 and $5.60 respectively in September.

Sago.—Prices weakened in Singapore during October. Pearl, Small Fair, averaged $5.26 per picul, and Flour, Sarawak Fair, $3.10, as compared with $5.36 and $3.21 respectively in September.

Tobacco.—The range of prices per picul was as follows:—1st quality $25 to $45, 2nd quality $15 to $38, 3rd quality $10 to $25. Prices of prepared tobacco in Kelantan were:—$100 to $110, $60 to $80, $40 to $60.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and fourpence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2

GENERAL RICE SUMMARY*

September, 1937.

Malaya.—Imports of foreign rice during September were 82,590 tons,† and exports 11,908 tons; net imports were therefore 70,682 tons as compared with 35,045 tons in 1936. Net imports from January to September totalled 452,187 tons as compared with 391,633 tons in 1936.¶

Of the September imports, 51 per cent. were consigned to Singapore, 18 per cent. to Penang, 7 per cent. to Malacca, 18 per cent. to the Federated Malay States and 6 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 47,209 (57.2), Burma 30,950 (37.5), French Indo-China 3,149 (3.8), other countries 1,282 (1.5).

The origin of net imports for the period January to September was as follows:—Siam 225,283 (49.8), Burma 200,597 (44.4), French Indo-China 18,894 (4.2), elsewhere 7,413 (1.6).

Of the exports during September, 72 per cent. were consigned to the Netherlands Indies and 28 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 8,517 (71.5), Burma 2,567 (21.6), French Indo-China 744 (6.2), parboiled 66 (0.6), Malayan production 14 (0.1).

India and Burma.—Foreign exports for the period January to August totalled 625,000 tons, as compared with 972,000 tons in 1936, a decrease of 35.7 per cent. Of these exports, 4.2 per cent. were to the United Kingdom, 6.1 per cent. to the Continent of Europe, 28.0 per cent. to Ceylon, 22.4 per cent. to the Straits Settlements and the Far East, and 39.3 per cent. to other countries. The corresponding 1936 percentages were 3.6, 17.9, 28.7, 20.9 and 28.9.

Siam.—Exports of rice and rice products from Bangkok during July were 67,486 tons as compared with 128,536 tons in 1936; the cumulative total for the year was 569,268 tons compared with 944,025 tons in 1936.

Japan.—According to a communication dated 13th October, 1937, received from the British Ambassador at Tokio, the first official estimate of the rice crop of Japan for 1937 is 9,395,816 tons, which is 0.5 per cent. less than the actual crop of last year, but 8.8 per cent. above the average of the last five years.

The first official estimate of the Korean crop for 1937 is 3,471,657 tons, which is 27.5 per cent. above the actual crop of last year and 38.8 per cent. above the average of the last five years.

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* Abridged from the Rice Summary for September, 1937, compiled by the Department of Statistics, Straits Settlements and Federated Malay Statts.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936.

French Indo-China.—Entries of padi into Cholon from January to September were 1,212,222 tons, as compared with 1,275,689 tons in 1936, a decrease of 5 per cent. Exports of rice during the same period were 1,206,758 tons as compared with 1,371,077 tons in 1936, a decrease of 12 per cent.

The exports of rice and padi for September totalled 129,769 tons and included unusually heavy shipments to Tonkin (14,759 tons), caused by the serious floods and consequent distress in that area. It is noted that under the influence of events in the Far East, exports to that quarter have almost doubled.

Prices of rice and padi have been increasing almost without interruption since the beginning of June. The rising tendency continued in September. Prices of white rice on 1st, 15th and 30th September were $3.38, $3.48 and $3.60 per picul. The tendency at the end of the month was to a rapid rise. Padi opened at $2.08 per picul, and rose to $2.23 by the 15th, and after steadying, rose to $2.28 at the end of the month, with prospects of a continued rise.

Netherlands Indies.—The latest information available was published in the May Summary.

Ceylon.—Imports from January to September totalled 400,581 tons as compared with 398,563 tons in 1936, an increase of 0.5 per cent. Of these imports, 17 per cent. were from British India, 69.6 per cent. from Burma, 0.1 per cent. from the Straits Settlements, and 13.3 per cent. from other countries. Corresponding 1936 percentages were as follows:— 13.2, 62.2, 0.5 and 24.1.

Europe and America.—Shipments from the East to Europe from the 1st January to 9th September totalled 892,956 tons, as compared with 894,639 tons in 1936, a decrease of 0.2 per cent. Of these shipments, 45.2 per cent. were from Burma, 48.2 per cent. from Saigon, 4.7 per cent. from Siam, and 1.9 per cent. from Bengal. Corresponding percentages for 1936 were 30.0, 60.8, 8.2 and 1.0.

Shipments to the Levant from 1st January to 4th September were 11,757 tons, as compared with 9,363 tons in 1936, an increase of 25.6 per cent.

Shipments for Cuba, West Indies and America from 1st January to 4th September were 191,444 tons as compared with 184,850 tons in 1936, an increase of 3.6 per cent.

MALAYAN AGRICULTURAL EXPORTS, SEPTEMBER, 1937.

PRODUCT.	Net Exports in Tons				
	Year 1936	Jan.-Sept. 1936	Jan.-Sept. 1937	September 1936	September 1937
Arecanuts ...	26,548	21,238	23,241	881	2,747
Coconuts fresh † ...	114,314†	93,025†	69,487†	14,593†	10,282†
Coconut oil ...	46,507	34,819	29,521	4,166	4,114
Copra ...	76,681	56,113	50,171	11,496	9,651
Gambier, all kinds ...	2,188	1,594	1,536	191	232
Copra cake § ...	20,438§	15,455§	11,010§	1,917§	1,503§
Palm kernels ...	4,964	3,420	4,641	677	537
Palm oil ...	29,296	21,090	31,079	3,145	2,911
Pineapples canned ...	76,403	63,891	68,769	3,323	4,180
Rubber ¶ ...	365,005¶	265,159¶	366,892¶	30,430¶	46,047¶
Sago,—flour ...	6,180	6,602	10,397	1,075	1,883
,, —pearl ...	3,319	2,441	2,563	315	452
,, —raw ...	7,484*	5,494*	5,951*	719*	662*
Tapioca,—flake ...	1,535	1,216	838	86	121
,, —flour ...	2,418*	1,402*	1,678*	74*	365*
,, —pearl ...	17,797	12,864	12,851	1,255	2,807
Tuba root ...	599	490	480	51	48

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1937	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,984.8	865.0	360.4	156.0
February ...	1,759.6	1,851.8	323.6	308.7
March ...	1,798.4	1,473.4	358.7	256.1
April ...	1,573.1	1,237.2	308.0	226.0
May ...	1,587.6	1,285.2	257.8	186.4
June ...	1,671.8	1,611.7	288.9	252.5
July ...	2,651.0	1,860.5	411.6	269.6
August ...	3,767.7	1,762.2	616.8	274.0
September ...	3,179.5	1,492.5	621.6	247.1
Total ...	19,973.5	13,439.5	3,547.4	2,176.4
Total January to Sept., 1936 ...	17,025.0	5,957.9	2,701.8	922.8
Total for the year 1936 ...	23,081.2	8,812.3	3,791.0	1,340.7

Stocks on estates at the 30th September, 1937 were: palm oil 3,612 tons; palm kernels 1,146 tons.

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH SEPTEMBER, 1937.

STATE OR TERRITORY	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total area not tapped (5) + (7)	Percentage of (11) to (2)
				ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING (*a*)					
				Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)	Acreage	Percentage of (9) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
STRAITS SETTLEMENTS :—											
Province Wellesley ...	43,762	28,223	64.5	128	0.3	15,411	35.2	324	0.7	15,539	35.5
Malacca ...	123,268	85,225	69.1	355	0.3	37,688	30.6	2,470	2.0	38,043	30.9
Penang Island ...	2,593	1,837	70.8	—	—	756	29.2	75	2.9	756	29.2
Singapore Island ...	32,979	21,292	64.6	1,321	4.0	10,366	31.4	125	0.4	11,687	35.4
Total S.S. ...	202,602	136,577	67.4	1,804	0.9	64,221	31.7	2,994	1.5	66,025	32.6
FEDERATED MALAY STATES :—											
Perak ...	291,813	221,427	75.9	2,353	0.8	68,033	23.3	7,465	2.6	70,386	24.1
Selangor ...	332,626	256,293	77.1	2,838	0.8	73,495	22.1	10,563	3.2	76,333	22.9
Negri Sembilan ...	259,496	190,671	73.5	2,286	0.9	66,539	25.6	9,403	3.6	68,825	26.5
Pahang ...	84,580	63,075	74.6	3,897	4.6	17,608	20.8	9,237	10.9	21,505	25.4
Total F.M.S. ...	968,515	731,466	75.5	11,374	1.2	225,675	23.3	36,668	3.8	237,049	24.5
UNFEDERATED MALAY STATES :—											
Johore ...	475,865	353,300	74.2	3,641	0.8	118,924	25.0	37,341	7.8	122,565	25.8
Kedah ...	197,682	149,914	75.8	3,196	1.6	44,572	22.6	6,978	3.5	47,768	24.2
Kelantan ...	28,350	22,487	79.3	403	1.4	5,460	19.3	3,060	10.8	5,863	20.7
Trengganu (*b*) ...	4,817	3,044	63.2	—	—	1,773	36.8	100	2.1	1,773	36.8
Perlis ...	1,330	689	51.8	—	—	641	48.2	107	8.0	641	48.2
Brunei ...	5,549	3,715	67.0	1,145	20.6	689	12.4	774	13.9	1,834	33.0
Total U.M.S. ...	713,593	533,149	74.7	8,385	1.2	172,059	24.1	48,360	6.8	180,444	25.3
Total Malaya ...	1,884,710	1,401,192	74.3	21,563	1.2	461,955	24.5	88,022	4.7	483,518	25.7

Notes :—(*a*) Area out of tapping on estates which have partly ceased tapping refers to areas definitely being rested and includes areas rested under rotational systems, but excludes areas on any tapping round in respect of Perlis only.
(*b*) Registered companies only.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF SEPTEMBER, 1937, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports during the month		Imports Jan. to Sept. 1937		Exports including re-exports during the month		Exports including re-exports Jan. to Sept. 1937		Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1937	during the month	Jan. to Sept. 1937	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1937
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	10,128	14,205	14,129	121,129	8,677	65,992	Nil	Nil	Nil	Nil	18,564	8,064	134,393	50,338	...	6,431	14,066	14	143
Johore ...	...	3,217	5,103	6,036	52,299	5,106	37,918	Nil	24	Nil	2,279	4,284	8,919	30,731	62,348	...	1,707	4,576	...	...
Kedah ...	...	717	3,550	3,546	29,517	1,474	11,541	Nil	Nil	Nil	Nil	2,167	3,423	18,867	22,412	...	535	3,162	...	...
Perlis ...	...	32	14	18	129	30	224	Nil	Nil	Nil	Nil	Nil	74	Nil	355	...	10	10	...	...
Kelantan ...	...	754	401	343	3,316	1,325	7,525	Nil	Nil	Nil	Nil	399	1,428	2,857	7,472	...	705	291	...	...
Trengganu ...	...	55	50	370	2,691	185	1,346	Nil	Nil	Nil	Nil	Nil	555	Nil	4,037	...	55	50	...	...
Brunei ...	...	12	59	71	549	101	770	...	...	...	...	...	167	...	1,289	...	1	75	...	...
Total Malay States	...	14,915	23,382	24,513	209,630	16,898	125,316	Nil	24	Nil	2,279	25,414	22,630	186,848	148,251	...	9,444	22,230	14	143
S. SETTLEMENTS :—																				
Malacca ...	...	2,183	1,163	1,448	12,512	1,196	7,107	Nil		Nil		3,639		27,986		...	1,815	1,138	...	...
Province Wellesley	...	2,147	724	603	4,923	479	2,669	Nil		Nil		8,905		75,937		...	2,465	832	...	...
Penang ...	2,412	5,152	12	23	169	258	1,209	2,578	20,938	*27,069	141,828		Nil		Nil	2,606	6,313	8	...	...
Singapore ...	7,106	33,216	212	210	1,648	376	1,526	16,405		147,672		29,456		216,907		7,817	32,712	171	37	289
Labuan ...	...	37	Nil	Nil	Nil	43	183	89		502		Nil		Nil		...	28	Nil	...	...
Total Straits Settlements ...	9,518	42,735	2,111	2,284	19,252	2,352	12,694	19,065	20,938	*175,243	141,828	12,000	Nil	320,830	Nil	10,423	43,333	2,149	37	289
Total Malaya ...	9,518	57,650	25,493	26,797	228,882	19,250	138,010	19,065	20,962	*175,243	144,107	67,414	22,630	507,678	148,251	10,423	52,777	24,379	51	432

* Figures amended

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	5,432	32,094	6,051	4,062	1,269	112
WET RUBBER	999	618	262	247	438	423
TOTAL ...	6,431	32,712	6,313	4,309	1,707	535

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Sept. 1937
29	30	31
Singapore ...	48,130	341,104
Penang ...	13,086	115,560
Port Swettenham.	6,008	49,061
Malacca ...	190	1,953
MALAYA ...	67,414	507,678

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Sept. 1937
32	33	34
Malay States ...	48,007	332,667
Straits Settlements	4,502	31,667
MALAYA ...	52,509	364,334

Notes:—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 26th October, 1937

METEOROLOGICAL SUMMARY, MALAYA, SEPTEMBER, 1937.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of		Mean of A and B	Absolute Extremes				At 1 foot	At 4 feet	Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.		Highest Max.	Lowest Min.	Lowest Max.	Highest Min.					Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	90.0	72.1	81.1	95	70	83	74	83.8	84.8	10.66	270.8	2.24	17	14	3			174.15	5.81	48
Bukit Jeram, Selangor ...	89.2	73.0	81.1	93	71	85	75	84.8	87.2	4.64	117.9	1.42	19	13				180.05	6.00	49
Sitiawan, Perak ...	90.0	73.6	81.8	95	70	87	76	84.5	85.5	4.88	124.0	0.86	18	16	2			173.10	5.77	48
Temerloh, Pahang ...	90.8	72.4	81.6	95	71	85	75	86.2	87.0	6.57	166.9	1.40	19	19		3		174.50	5.82	48
Kuala Lipis, Pahang ...	89.6	71.3	80.5	93	69	86	74	84.4	85.3	17.07	433.6	4.16	21	19		27		159.55	5.32	44
Kuala Pahang, Pahang ...	87.5	73.9	80.7	90	72	83	77	87.5	88.5	6.80	172.7	3.13	13	12			2	177.30	5.91	49
Kallang Aerodrome, S'pore ...	85.3	76.6	80.9	88	73	80	81	83.2	84.2	7.95	201.9	1.69	14	12	6		1	154.70	5.16	43
Butterworth, Province Wellesley ...	87.0	74.2	80.6	90	72	83	77	85.1	86.0	7.41	188.2	1.10	21	19				176.35	5.88	49
Bayan Lepas Aerodrome Penang ...	86.6	74.6	80.6	88	70	85	77	83.9	84.9	14.49	368.1	1.98	22	20	4			171.45	5.71	47
Bukit China, Malacca ...	85.3	73.6	79.5	88	71	82	76	83.3	84.7	14.76	374.9	2.73	19	17	1		3	155.25	5.17	43
Kluang, Johore ...	87.4	70.9	79.1	91	68	84	72	81.5	82.5	7.54	191.6	1.36	21	16	5	3		143.35	4.78	39
Bukit Lalang, Mersing, Johore	87.5	71.4	79.5	91	70	85	73	82.0	82.2	5.42	137.7	1.59	15	13	2	1	1	175.10	5.84	48
Alor Star, Kedah ...	86.7	73.7	80.2	91	71	81	76	83.4	85.3	12.74	323.6	2.57	24	22	1			164.55	5.49	45
Kota Bahru, Kelantan ...	88.8	72.9	80.9	91	71	86	75	84.3	85.4	13.62	346.0	2.65	16	15	3		1	181.85	6.06	49
Kuala Trengganu, Trengganu	87.6	72.9	80.3	90	70	84	75	83.0	84.6	10.09	256.3	1.50	19	17	6		1	197.25	6.57	54
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	74.7	62.3	68.5	79	61	72	64	73.1	73.3	9.77	248.2	2.06	22	20	1	16		157.80	5.26	43
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.3	57.7	65.0	75	52	70	62	71.3	70.8	11.32	287.5	1.98	21	20				124.05	4.13	34
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	72.3	59.4	65.9	76	58	69	61			11.24	285.5	2.13	21	20				127.00	4.23	35

Compiled from Returns supplied by the Meteorological Branch, Malaya.